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## GEOLOGY AND PALEONTOLOGY.

**Continuity of the Glacial Epoch.**—The question of *Pre-glacial* or *Inter-glacial* erosion of the rocky gorge of the Ohio River and its tributaries is made the subject of a paper by Rev. G. Frederick Wright in the *Am. Journ. Sci.*, March, 1894. The writer, as it is well known, maintains the former theory, and gives the following summary of the course of events connected with the Glacial period, stating more fully than has heretofore been done how those who question the long interglacial epoch can account for what has been called the moraine of the second Glacial epoch, and for the river terraces which everywhere, east of the Mississippi River, head near the moraine

“1st. The earlier portions of the Tertiary period were characterized, throughout all the northern hemisphere, by low altitude of land and a warm temperature even in close proximity to the pole.”

“2d. A period of slow continental elevations of the regions which are now covered by Glacial drift, extending through some hundreds of thousands of years, was in progress late in the pliocene epoch. During this stage of events, the fiords which characterize the northern portions of both Europe and America, and the extensive rock gorges, like those of the upper Ohio River and its tributaries, were eroded.”

“3d. Contemporaneously with this continental elevation at its maximum stage, and chiefly as a consequence of it, Glacial conditions characterized all the higher latitudes of North America and Western Europe. In eastern North America, the center of Glacial radiation was in the vicinity of James Bay. A land elevation of three or four thousand feet would perhaps have been sufficient to produce the Glacial conditions; but the accumulation of the Glacial ice would eventually raise the surface several thousand feet higher.”

“4th. Before the climax of the Glacial period, and perhaps in consequence of its burden of ice, the glaciated area began to sink until the land was, north of the Great Lakes at any rate, several hundred feet, at least, lower than it is now. But for some time after the beginning of the subsidence of the land, the rate of accumulation of ice would be greater than that of the subsidence, so that the general level of the glacier continued to rise. Thus the maximum extension of the ice field was actually reached but a short time before the decline of the period set in.”

"5th. As suggested to me by Mr. Upham, 'The frontal slope of the ice surface was then less steep than when the warmer climate, bringing the end of the Glacial period, had begun to melt away the southern border.' At the maximum of extent, the slope may be represented as terminating in a very gentle declivity, allowing some transportation of bowlders to the boundary, but not generally so steep as to produce there any well defined moraine. In the glacial recession the warm sunshine and rains were especially efficient, on a belt a few miles or a few tens of miles wide adjoining the boundary, so that when any temporary colder series of years caused a halt or slight re-advance, a moraine would be formed."

"6th. From the time the ice first entered the headwaters of the Allegheny, the Susquehanna, and the Delaware Rivers, the silting up of their channels began. This was effected largely by means of the excessive amount of the Glacial debris brought within reach of the streams. But during the earlier retreat of the ice front from its maximum extent, the silting was facilitated by the differential northerly depression, which existed. During a part of this time, also, it was facilitated in the Ohio Valley by the Glacial dam at Cincinnati."

"7th. After some thousands of feet of ice had melted off, relieving the land from a large part of its burden, the re-elevation of the continent began; (and, as probably the most of the sedimentation of the pre-glacial river gorges had been effected during the earlier portion of this period of recession), there was then an indefinitely prolonged period of reëxcavation by continuous torrents of comparatively clear water, facilitated in the Ohio Valley by the wearing away of the Cincinnati dam, which increased by so much the gradient of the stream."

"8th. When equilibrium had been established again, the land was at about its present altitude, but was still covered to a considerable depth with ice north of the most prominent moraines. The great size of these moraines is partly due to the vast amount of englacial material held in the lower strata of the ice."

"9th. The deposits of the so-called Champlain epoch near the margin of the glaciated area were considerably earlier in time than those which settled over the Champlain Valley itself, since no deposits could take place there until the ice had retreated from the area; but these deposits are properly classed together as Champlain, since they belong to one epoch of general movement."

"10th. So great a complication of causes was connected with the production of all the phenomena connected with the period, that there

were doubtless many oscillations of the ice front, both during the general advance and the general retreat of the ice sheet. The extent and continuance of these oscillations is to be learned from study of the buried forests and vegetal deposits which lie between the earlier and later sheets of till, and by such instances of erosion as may be clearly proved to be inter-glacial. But there does not seem to be evidence of any oscillations of the front sufficient to break the proper continuity of the period."

### The Colorado Formation and its Invertebrate Fauna.<sup>1</sup>—

In a study of a collection of fossils from southern Colorado, Mr. T. W. Stanton found it necessary to review, not only the species definitely assigned to the Colorado Formation, but also a number of doubtful ones vaguely referred to the Cretaceous of Utah and New Mexico. The results of his investigations are published as Bull. No. 106 of the U. S. Geol. Surv., an octavo volume of 189 pages, and forty-five plates. In the compilation of the species, the nomenclature and descriptions have been carefully revised in all cases where better collections or additional facts seemed to make it necessary. Thirty-nine species are believed to be new to science. Mr. Stanton gives a comparison of the lists of fossils to show that the invertebrate fauna of the Colorado formation cannot be subdivided into the well defined zones recognized in Europe, but the fauna on the whole may be regarded as the approximate taxonomic equivalent of the Turonian.

**New Polyzoans from the Belgian Cretaceous.**—Mr. Ed. Bergens is about to publish a descriptive work with plates of the Cretaceous Polyzoans collected near Limbourg, Belgium. In this work the author figures a score of colonies from the Maestricht formation (Fox Hills) of great rarity. Among the known species is an example of *Lichenopora diadema* Gldfs. with an ovarian cell completely developed; an entire colony of *Camerapora*; a colony of *Retecava clathrata* Gldfs. with the base rounded, figured in this rolled state as *Neuropora cretacea* by Von Hagenow.

The other forms are new and many of them are referred to new genera. The author recognizes the genus *Eschara*, although it is composed of heterogeneous elements, in order not to augment uselessly the synonymy, for a study of the soft anatomy has not yet allowed a definite classification to be made. (Bull. Soc. Belge de Geol. Pal. et Hydrog. T. VII, 1893).

<sup>1</sup>Bulletin United States Geological Survey, No. 106. The Colorado Formation and its Invertebrate Fauna. T. W. Stanton. Washington, 1893.

**Geological News.**—GENERAL.—In regard to the term gneiss, Professor T. C. Bonney remarks that it covers a group of rocks rather different in character and very different in history. One (a common type) is a gneiss in consequence of an original structure, and remains very nearly in its original condition. Another (also common) owes its structure to pressure acting on a rock which had already solidified and had become crystalline. The Central Oberland and some parts of the Pennines afford examples. A third (rather rare and exceptional) is the result of the metamorphism of materials which were originally clastic. Such has been the origin of some of the banded gneisses in Sark, and more evidently in a mass of rock near the base of the Allalin glacier where veins of intrusive granite exhibit a banded structure which can only be explained by a movement of the material while still in a plastic condition. (Geol. Mag., March, 1894.)

ARCHEAN.—According to Mr. Robert Bell, many of the long straight valleys in the Archean regions of Canada now occupied by river stretches, by long, narrow lakes, and by inlets of larger lakes are due to the decay and removal of wide greenstone dykes, together with belts of rocks between them. The writer instances the inlets of the northern part of Georgian Bay, Onaping Lake, Long Lake, Sepiwek Lake with Nelson River, Mattagomi River and Lake Temiscaming. The latter is from one to two miles wide and has a length of 35 miles, but the channel is continued into Deep River. The writer estimates the depth of this excavation to be about 2,600 feet. Mr. Bell presents stratigraphical evidence to show that this valley existed before the date of the Niagara formation, and he believes that most of the valleys which mark the courses of the decayed dykes were formed before the deposition of the Paleozoic strata. (Bull. Geol. Soc. Am., Vol. 5, 1894).

Dr. U. S. Grant concludes, after study in detail of the granitic area near the eastern extension of the Mesabi range in Minnesota, that the rocks of this region are not altered sediment as has been thought heretofore, but that they are truly eruptive in nature and origin. They are sharply separated from the surrounding clastics, and of later date than those. (Ann. Rept. Minn. Geol. Surv. for 1892).

PALEOZOIC.—Among the Silurian Trilobites described by Messrs. R. Etheridge, Jr. and John Mitchell in Proc. L. S. N. S. W. issued March, 1894, are three new species: *Cyphaspis yassensis*, *C. horani* and

*C. rotunda*. The first is of interest as being the only Australian Trilobite in which the supposed auditory organs have been observed. These pores in *C. yassensis* are not situated in the facial sutures, but between them and the front rounded border of the glabella.

The Illinois State Museum has just issued a Bull. (No. 3, 1894) containing descriptions of new species of Invertebrates from the Paleozoic rocks of Illinois and adjacent States, described by Messrs. S. A. Miller and Wm. F. Gurley. The fossils comprise 4 species of Echinida, 49 Crinoidea and 4 Crustacea, referred respectively to 2, 29 and 2 genera. Eight page plates of drawings accompany the text, some of which are not as well executed as one would wish.

MESOZOIC.—In a revision of the genus *Cycadeoidea* Buckland, Dr. Lester Ward refers to the collection of six fine cycadean trunks recently found near Hot Springs, South Dakota. All the cycadean remains thus far found in the southern part of the Black Hills occur in the area marked by Professor Newton as Dakota Group. The fact that no cycadean vegetation has yet been found in the extensive collections from the Dakota group of Kansas and Nebraska, led to a careful examination of the series thus classed by Professor Newton, which results in the following conclusion. The Dakota group of Newton is much more extensive than No. 1 of Meek and Hayden, and while the upper portion certainly belongs to the true Dakota, the lower portion very probably extends to near the base of the Cretaceous. The cycadean trunks belong to this lower portion, and may not differ greatly in age from those found in Maryland described by Tyson. (Proceeds. Biol. Soc. Wash., Vol. IX, 1894).

A collection of Cretaceous plants from Vancouver Island yields 50 species of which 27 are new. These are described and figured by Sir Wm. Dawson in Trans. Roy. Soc. Canada, Sect. IV, 1893. In this connection the author points out the value of fossil plants as indicators of climate and time.

CENOZOIC.—A restoration of *Aceratherium fossiger* Cope has been made under the direction of Professor Williston for the Kansas University Museum. The skeleton is a "composite" made up, probably, of nearly as many individuals as there are bones. The different elements were selected from among many hundreds of specimens obtained from a fresh water Pliocene deposit near Long Island, Kansas. The

dimensions of the skeleton are as follows: Length, not including tail, 9 feet; height, 4 feet; greatest girth, 9 feet 4 inches. (Kansas Univ. Quart., April, 1894).

In discussing the mammoth remains in Canada and Alaska, Dr. G. M. Dawson notes that in the northwestern part of the continent they are abundant in, if not confined to the limits of a great unglaciated area there existing. This area comprises nearly the whole of Alaska and part of the adjacent Yukon district of Canada. No *mastodon* bones have been reported from this region. (Quart. Journ. Geol. Soc., Feb., 1894).

A collection of Tertiary Mammals is reported upon by Professor John Eyerman. The most of the specimens were obtained by Dr. Forsyth-Major, *in situ*, in southern France and Italy. The collection comprises 7 Insectivora; 3 Carnivora; 14 Rodentia; and 5 Ungulata. Of the Insectivora, one represents, according to Dr. Major, a new family and genus. Also there is one new genus of Murid rodents, closely related to the American *Paciculus* of Cope. (Am. Geol., Vol. XII, 1893).

Signor G. A. Amicis has just published (Bull. Soc. Geol. Ital., 1893) "I foraminiferi del pliocene inferiore di Trinité-Victor (Nizzardo)," an important contribution to our knowledge of the Pliocene Foraminifera of Italy. One hundred and twenty-six forms are recorded, to each of which a very full and interesting synonymy is given, while only two forms are recorded as new, an evidence of the extreme care bestowed upon his work by the author, who has swept away many varietal forms recently described as new by other authors from imperfect acquaintance with the literature. (Nat. Sci., Feb., 1894.)

In summing up the data concerning the drainage features of the upper Ohio Basin, Messrs. Chamberlain and Leverett agree that the evidence is very strong that the two uppermost sections of the Allegheny basin, (including also Oil Creek Basin) and the middle Allegheny discharged northwesterly; the evidence relative to the lower Allegheny and the upper setion of the Ohio River favors a northerly discharge, but is too incomplete to justify a firm opinion. The authors hold to the belief that no hypothesis of continuity can explain the phenomena of the glacial drift and terraces of the region under discussion. They offer four hypotheses in explanation of the phenomena observed, all of which agree on the most vital points, and all emphasize the importance and significance of the first glacial epoch. (Am. Journ. Sci., Vol. XLVII, 1894).